

# Phi - Intercalibration

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## Principle

- offline, statistical calibration
- phi symmetric physics  $\Rightarrow$  relative calibration of phi-symmetric cells
- miscalibration hypothesis :

$$E_{measured} = \alpha_i E_{real} + \beta_i$$

What sources of miscalibration are left ?

Non linear and gain correction : intercalibration of cells with respect to pulsers

- Electronic calibration not applied in reco. Significative difference between physic signal and calib signal ?
- Cells response to particles. (argon pollution ?)

## Intercalibration methods

### Flow methods:

use thresholds, energy flow or hit number in cells

- used in run I
- very efficient constant reconstruction

### Mean method

use mean energy ratios

- less efficient
- less sensitive to trigger bias

After several tests and comparisons **2 mean methods** were chosen

- As efficient as flow methods
- support for  $\beta$  constants
- high energy calibration (2 GeV by cells)

## Expected effects on resolution

Cell miscalibration contributes to the constant term of energy resolution

$$C^2 = C_0^2 + \left(\frac{I}{\sqrt{n}}\right)^2$$

$C_0$  : other contrib

$n$  : mean nb of cell  
in 1 Empart

$$I = \frac{\sigma(\alpha)}{\alpha} \quad \text{Cell miscalibration}$$

After intercalibration :

$$I^2 \rightarrow \left(\frac{I}{8}\right)^2 + I_{ic}^2$$

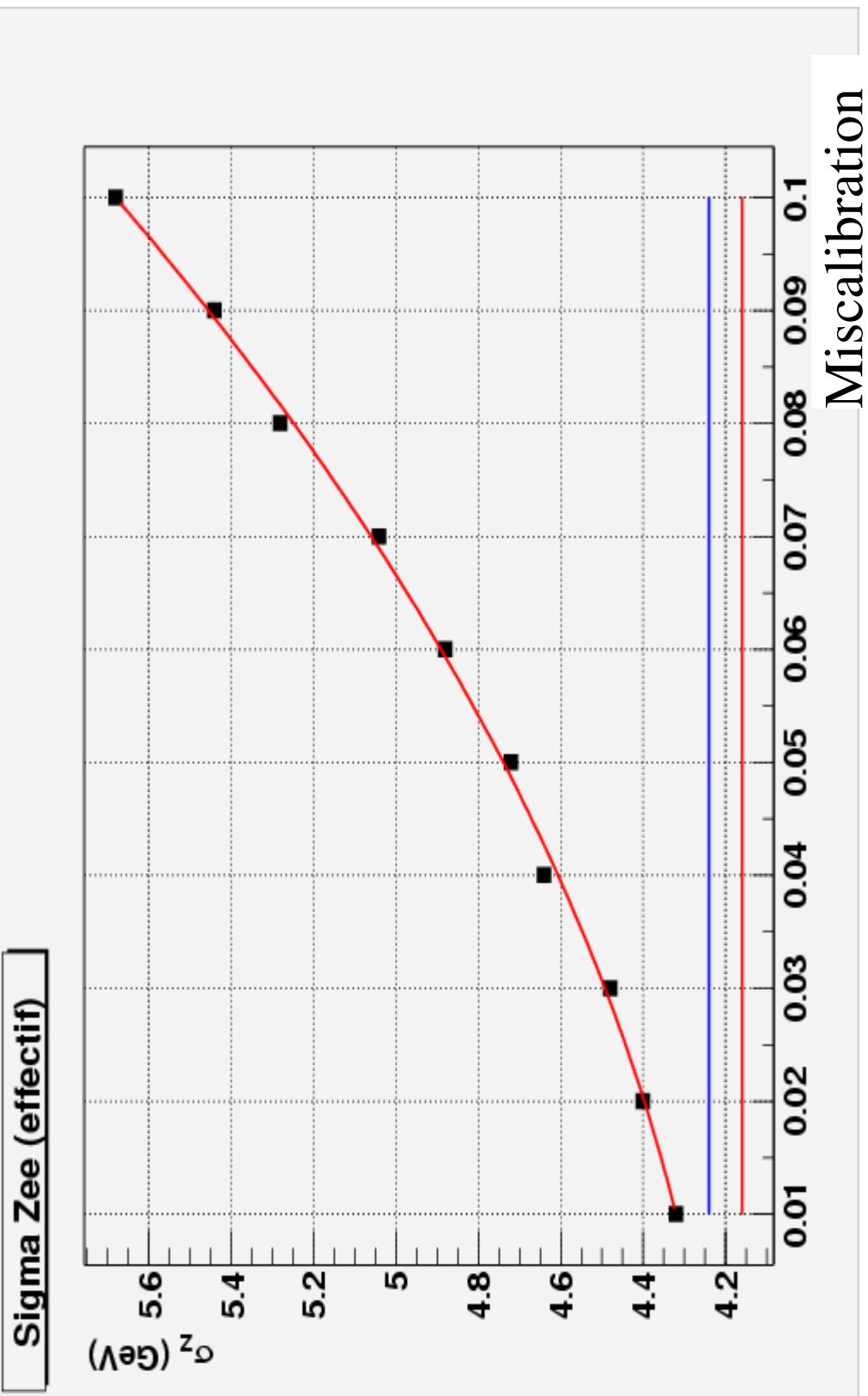
Test on M events:

Simulate miscalibration on MC Z events (p11.08)

Simulate correction with chosen precision.

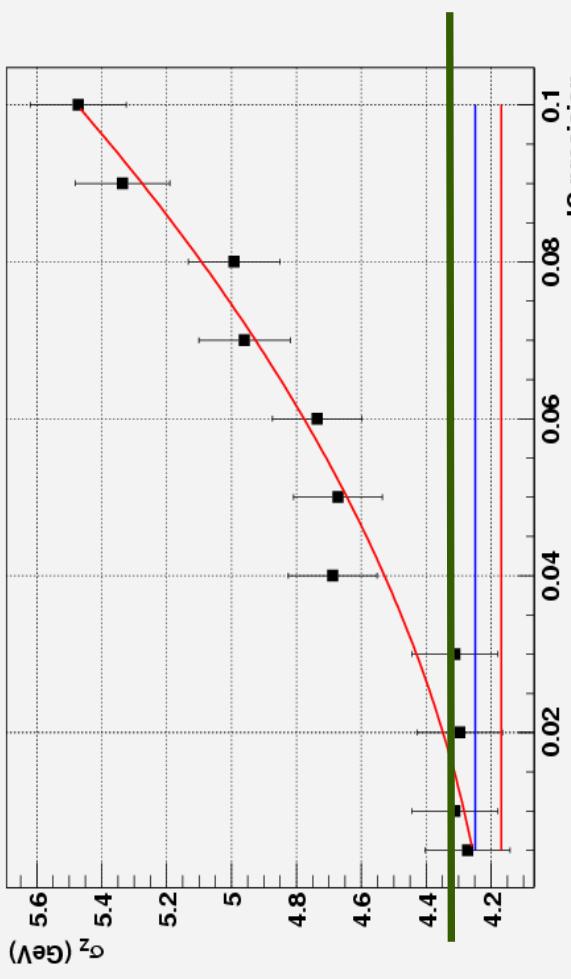
Compare effective sigma.

## Effects on Z width



## Effects on Z width - II

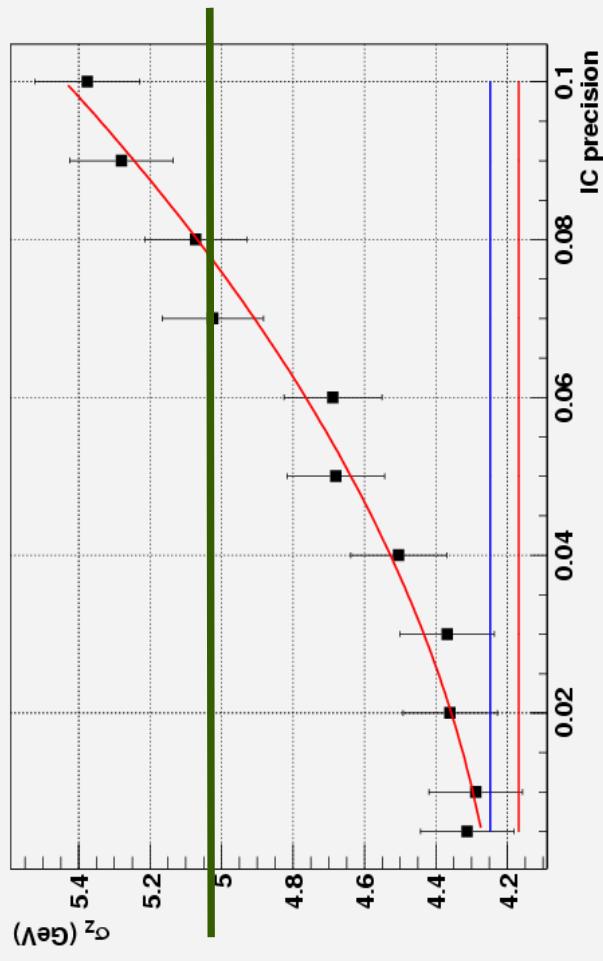
Sigma Value (miscalib 0.01)



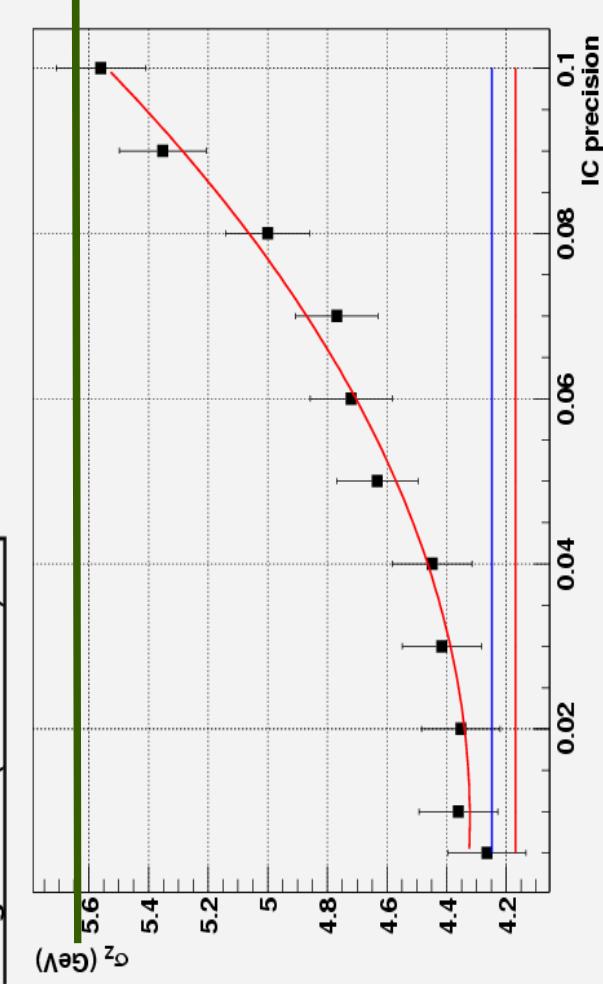
Sigma Value (miscalib 0.04)



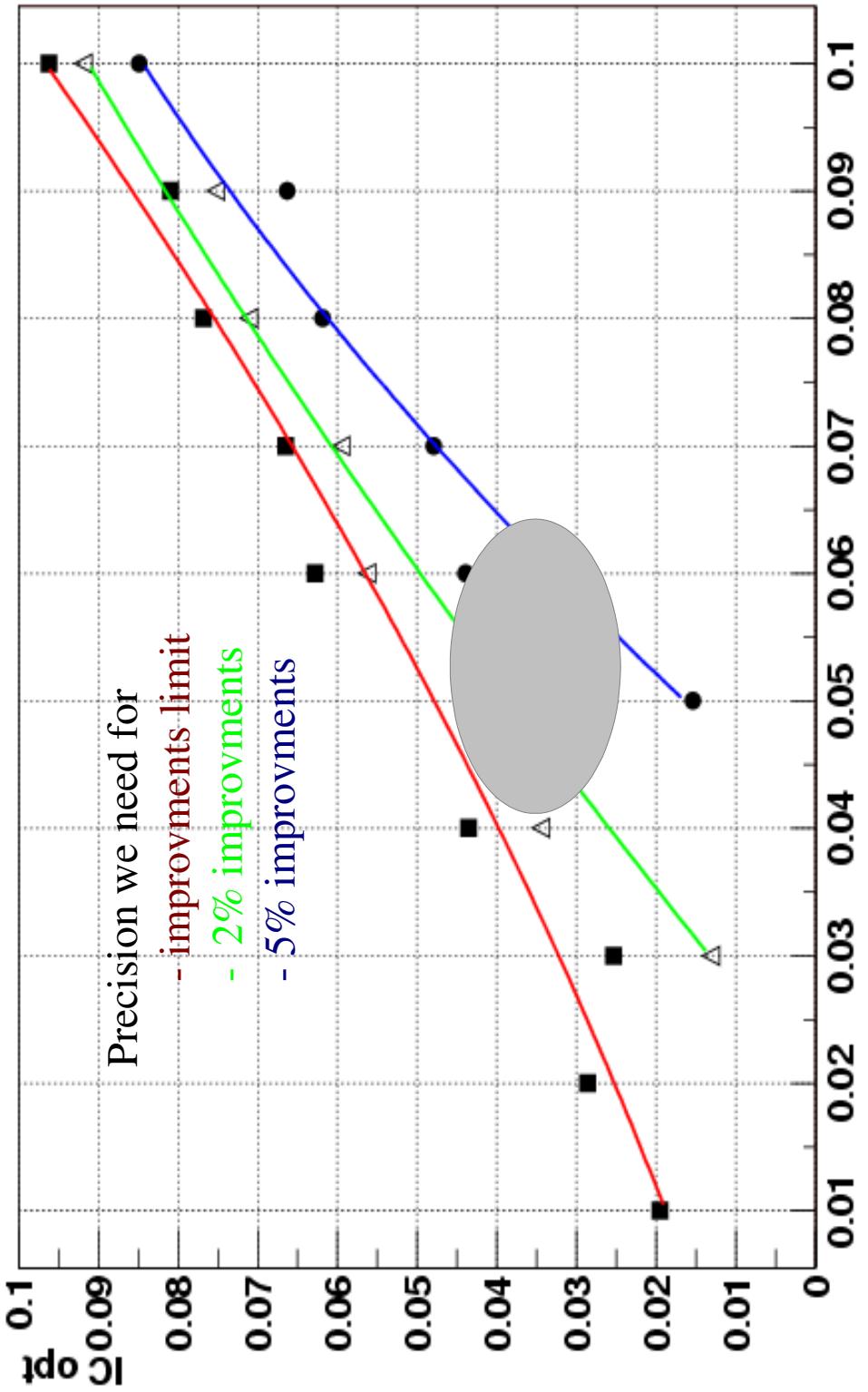
Sigma Value (miscalib 0.07)



Sigma Value (miscalib 0.1)



## Effects on Z width - III



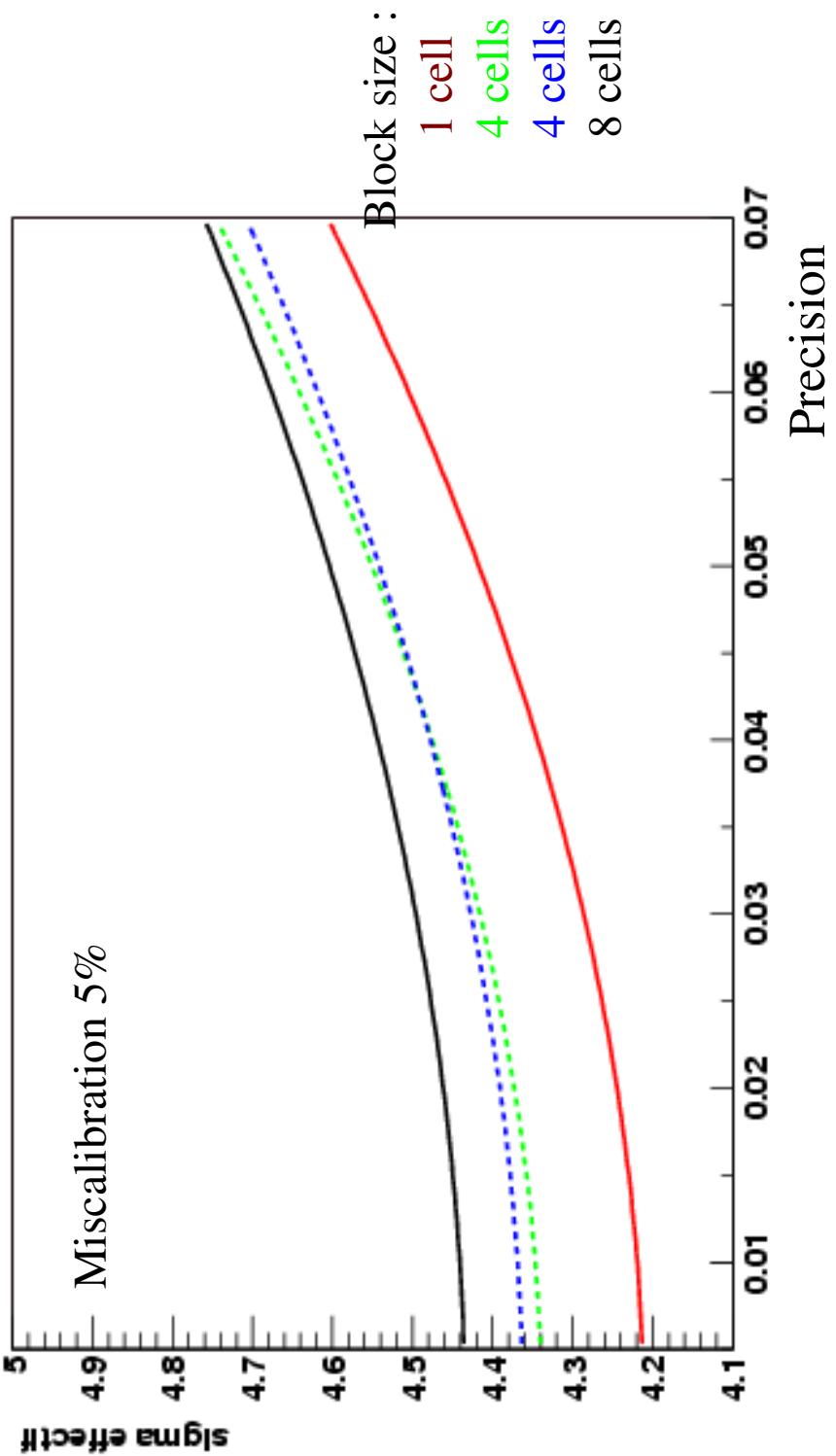
## Block intercalibration

1 constant  $\leftrightarrow$  1 cell

1 constant  $\leftrightarrow$  several cells

reconstructed constant = average cell constant +/- precision

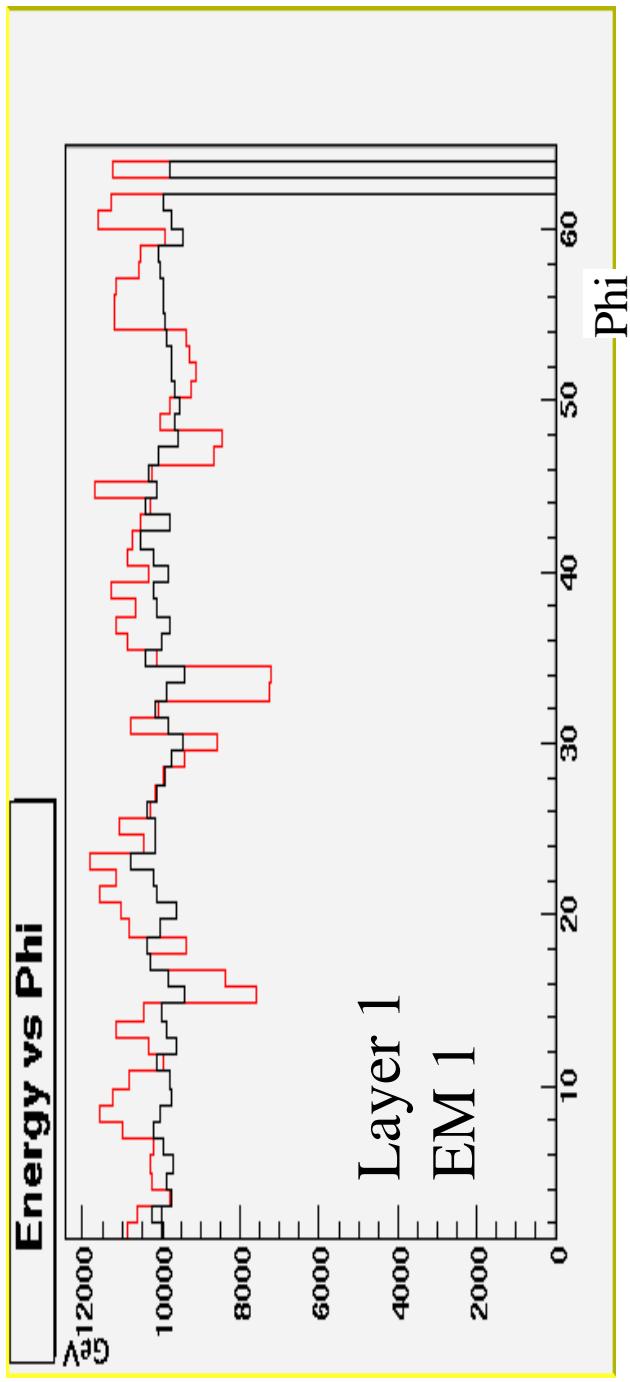
`sqrt([0]+[1]*x*x)`



## Old results

With first events :

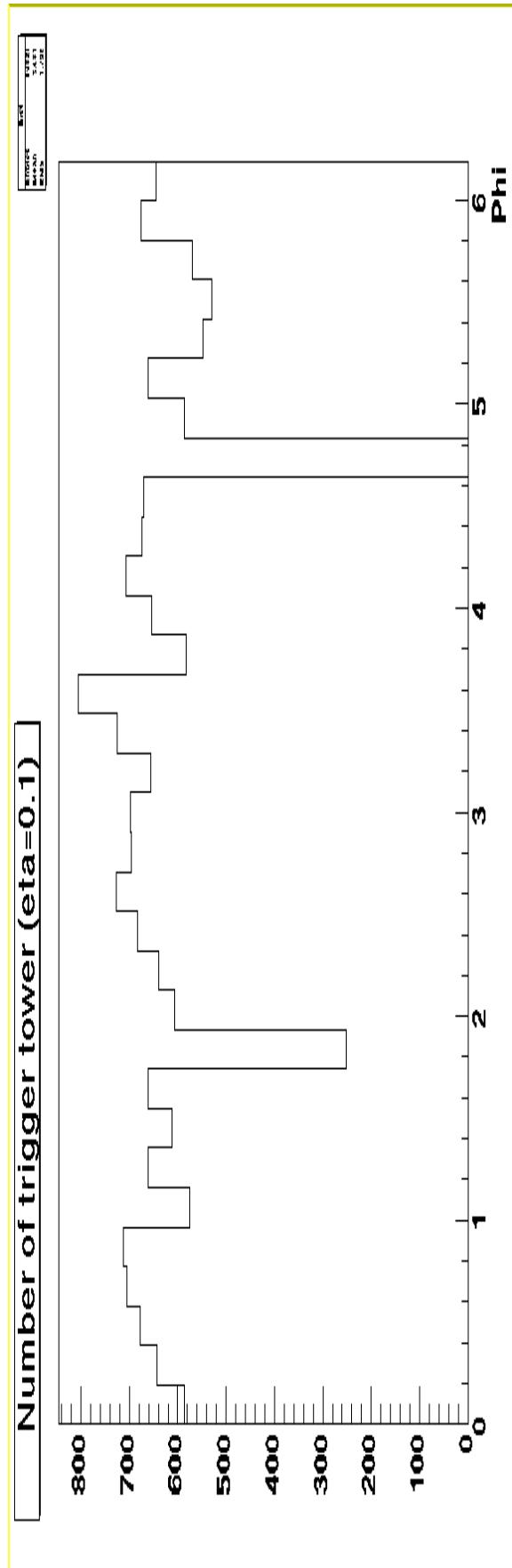
- use maximum statistic
  - not all trigger info in rootuples
- ⇒ No trigger selection



Z peak test : not enough statistic

# Trigger selection

Enough statistic, trgsim block in rootuples  $\Rightarrow$  trigger selection



## selection

- Choose evts such as same number of hits in trigger towers for final set
- Check energy and distribution in towers
  - If a tower is off : ignore corresponding cells during calibration

Last set of evts : from p11.11  
16M evts  $\rightarrow$  3.8M after selection  
only 60% of cell available

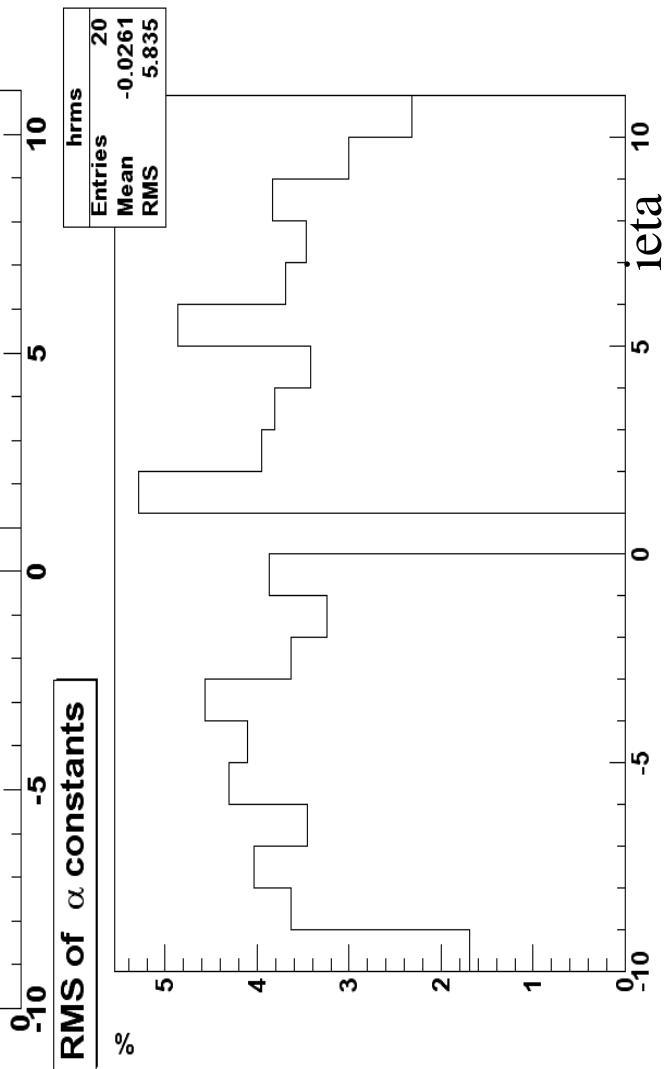
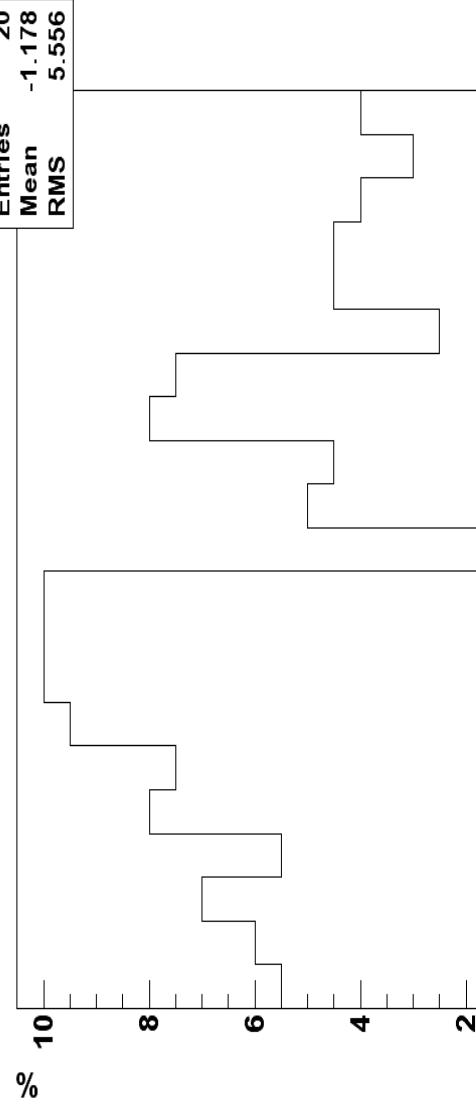
# Miscalibration estimation

Long term quality test...

## Estimation from data

- Get a distribution in a ring
- Generate, miscalibrate virtual rings
- compare RMS of mean energy in rings

**Miscalibration estimation from data**

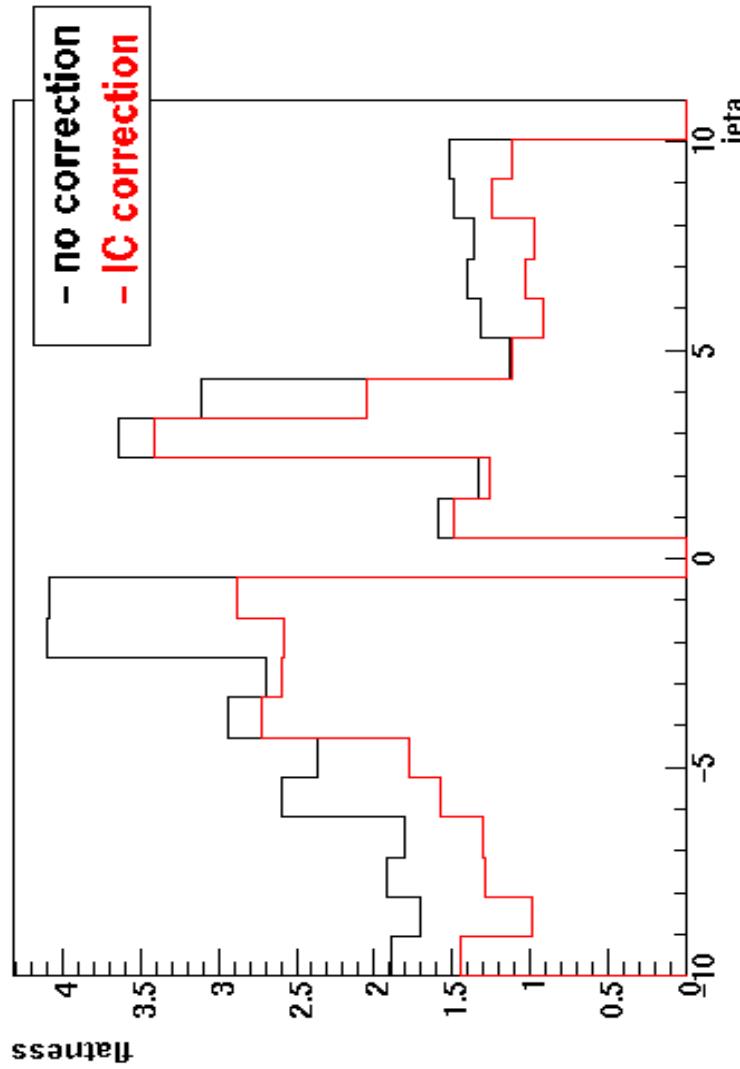


From reconstructed constants

Get RMS of reconstructed constants

# Constants evaluation

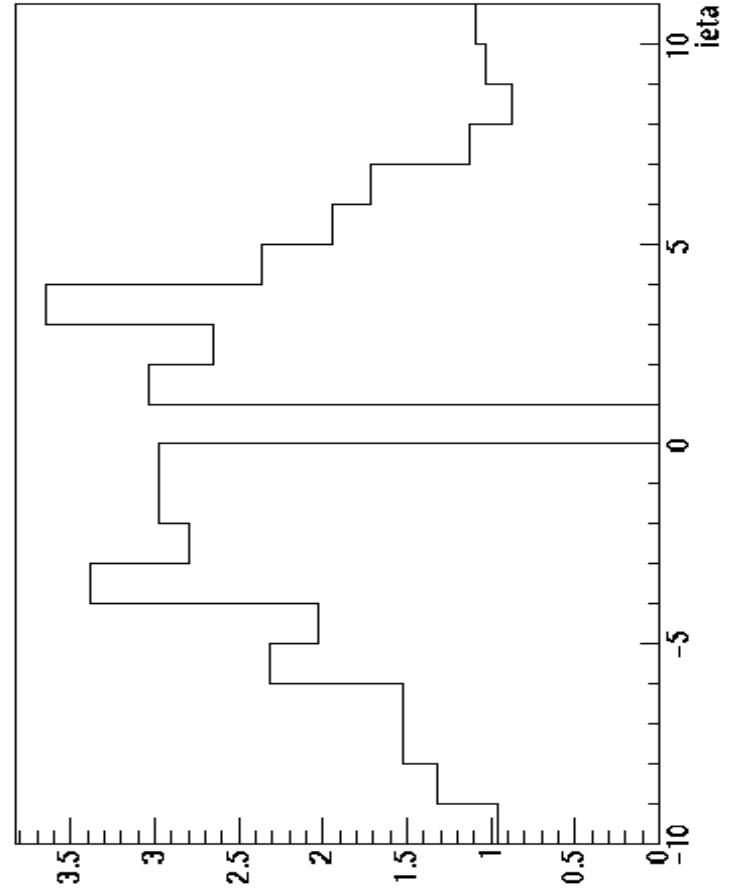
flatness in EM1 {mean Energy RMS )



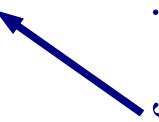
Estimated precision of  
reconstruction



Resolution in floor 1



Rings uniformity



## Z peak Test

Using p13 2EMpart skimming.

-Emid certif cuts.

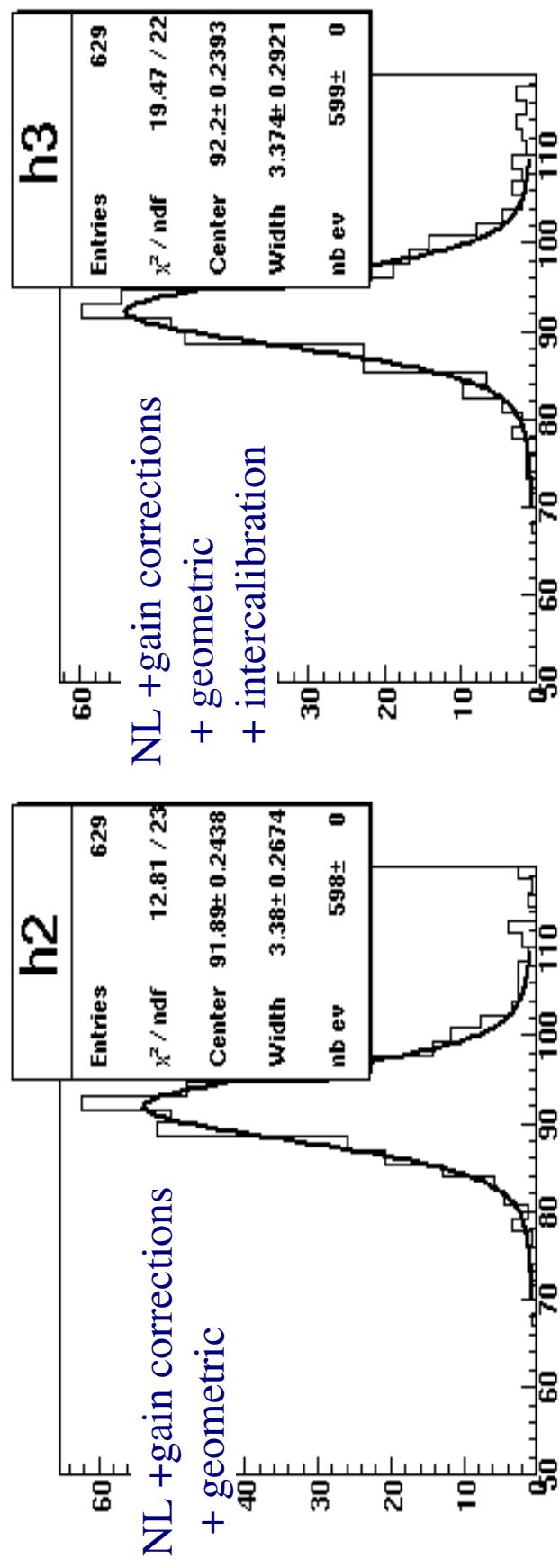
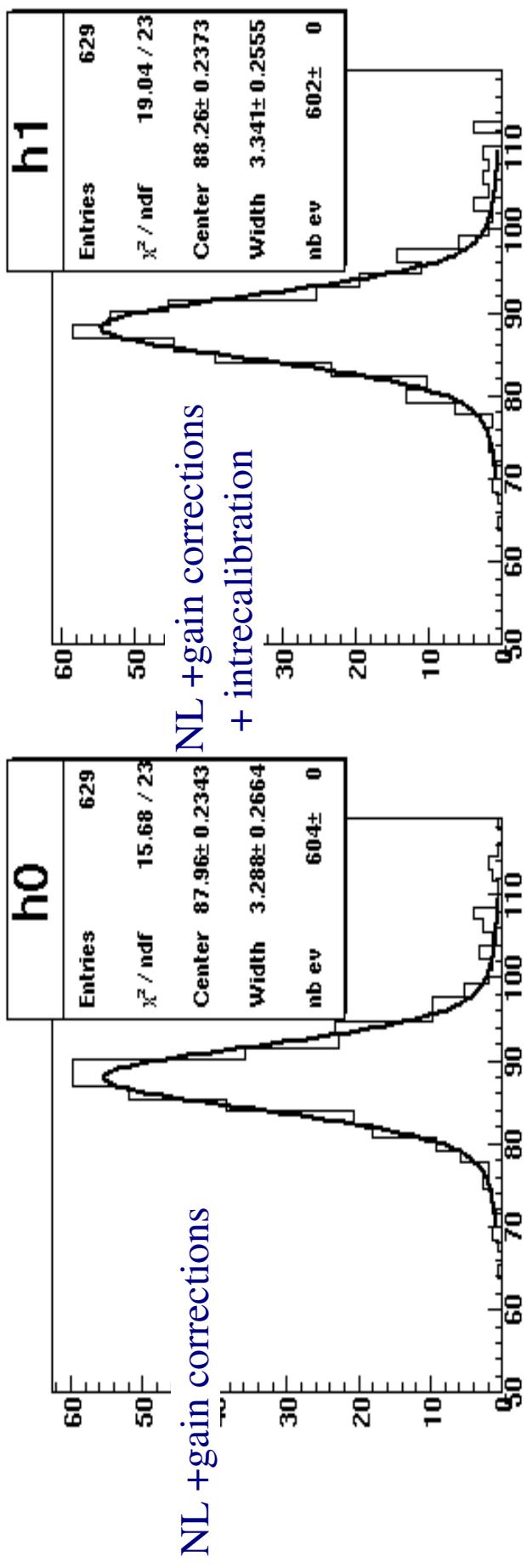
- 2 track matches

- fiducial cuts.

- central calorimeter

Did not have time to rewrite all our soft for TMB and redo a complete analysis  
with p13 data

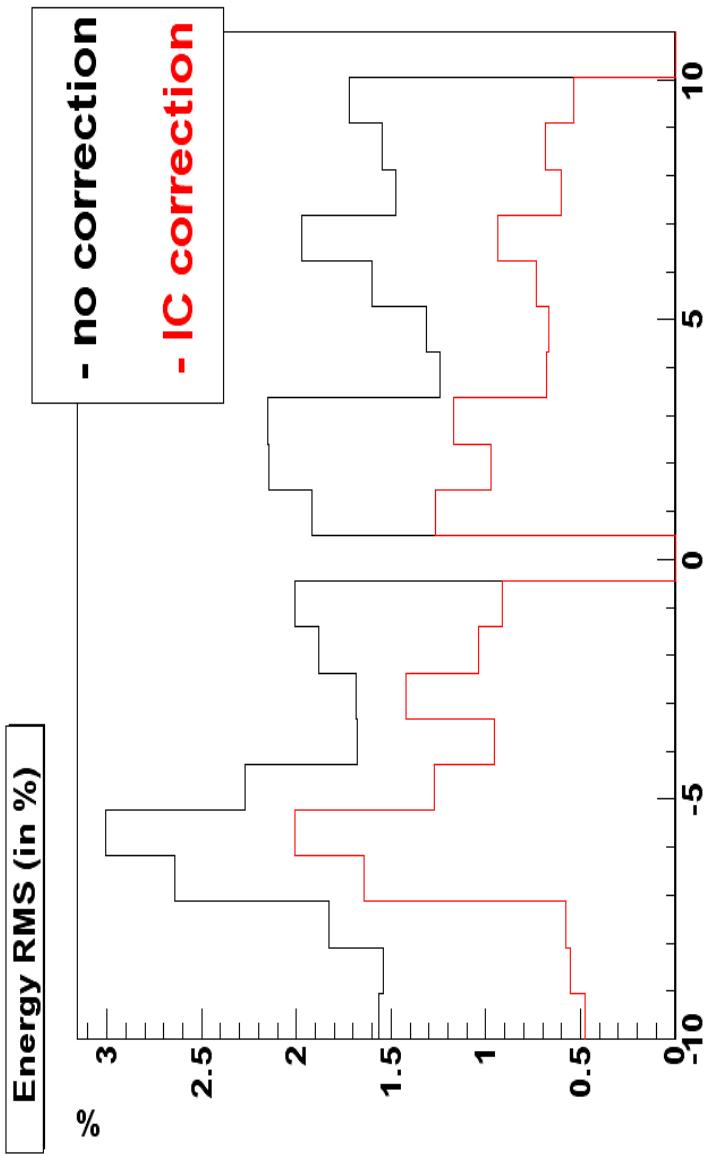
⇒ using constants calculated with p11



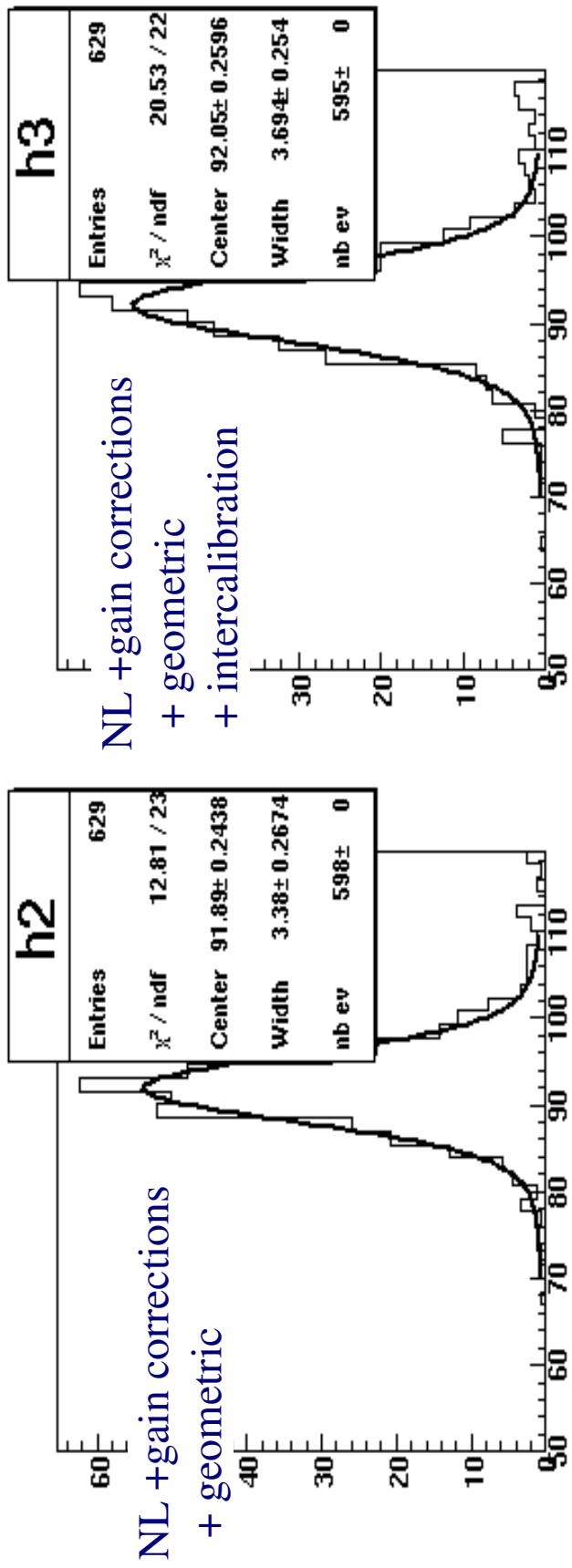
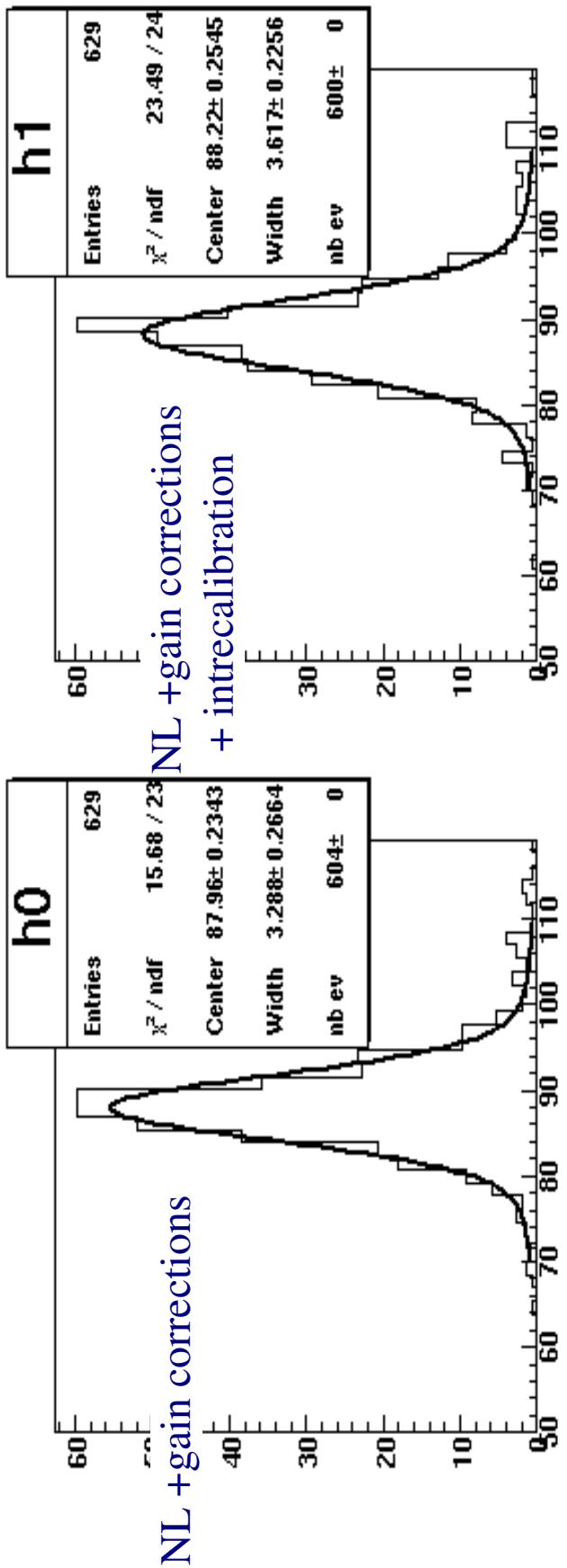
# Constant calculated from Emparticles

- Calibration zone :  $0.2 \times 0.2$  towers
  - > use energy of Empart in those towers.

640 constants calculated from p13.05 2EM skimming



Precision around 1%



# Conclusions

- **Simulation work**
  - If calorimeter is miscalibrated intercalibration can improve resolution
  - Calibration methods are efficient and optimized
  - But very sensitive to systematics effect
- **Data work**
  - Trigger selection procedure
  - Calculated constants are coherent
  - We can estimate miscalibration  $\Rightarrow$  calo is not phi-uniform !
  - No improvement on Z peak
  - Need very clean data
- **Futur**
  - adapt to thumbnail
  - Tests Z, missing Et
  - skimming, stream ??

